

WE CLAIM:

1. A concentrator for obtaining an enriched stream of a first fluid from a stream containing the first fluid and at least one second fluid, the concentrator comprising:

(a) a pressurizable adsorption zone having an inlet port for introducing the fluid stream to the adsorption zone, the pressurizable adsorption zone operable to produce the enriched stream;

(b) a pressurizable container for receiving at least a portion of the enriched fluid stream;

(c) a passageway extending between the pressurizable adsorption zone and the pressurizable container;

(d) an enriched fluid outlet for delivering at least a portion of the enriched fluid stream downstream of the concentrator;

(e) a purge valve in flow communication with the pressurizable adsorption zone and moveable between a closed position and an open position in which the pressurizable adsorption zone is purged during a purging cycle; and

(f) a mechanical displaceable member operably associated with the purge valve to move the purge valve from its closed position to its open position, the displaceable member being in flow communication with the pressurizable container and moveable outwardly between a charging position in which the pressurizable container is being pressurized and an actuating position in which the purge valve is in its closed position upon the pressurizable container

reaching a preset pressure.

2. The concentrator as claimed in claim 1 the stream is at an elevated pressure when introduced to the pressurizable adsorption zone and the elevated pressure of the fluid stream provides essentially the only motive force to operate the concentrator.

10 <sup>13/</sup>3. The concentrator as claimed in claim <sup>11/</sup>1 wherein the displaceable member is biased to the charging position.

15 <sup>14/</sup>4. The concentrator as claimed in claim <sup>13/</sup>3 wherein the displaceable member is a rigid member which moves outwardly from the pressurizable container along a pathway from the charging position to the actuating position.

<sup>15/</sup>5. The concentrator as claimed in claim <sup>13/</sup>3 wherein the displaceable member is a resilient member.

20 <sup>14/</sup>6. The concentrator as claimed in claim <sup>15/</sup>5 wherein the resilient member forms part of a wall of the pressurizable container.

25 <sup>17/</sup>7. The concentrator as claimed in claim <sup>15/</sup>5 wherein the resilient member contacts the purge valve when in the actuating position.

30 <sup>18/</sup>8. The concentrator as claimed in claim <sup>15/</sup>5 wherein the purge valve is spaced from and positioned outwardly from the displaceable member and is contacted by the displaceable member as the displaceable member moves to the actuating position.

19/9. The concentrator as claimed in claim 15 further comprising a linking member having a first portion and a second portion, the second portion operatively connected to the purge valve, the resilient member contacting the first portion when in the  
5 actuating position.

20/10. The concentrator as claimed in claim 11 wherein the purge valve is spaced from and positioned outwardly from the displaceable member and is contacted by the displaceable member as  
10 the displaceable member moves to the actuating position.

21/11. The concentrator as claimed in claim 11 wherein the purge valve is spaced from and positioned directly outwardly from the displaceable member and is contacted by the displaceable  
15 member as the displaceable member moves to the actuating position.

22/12. The concentrator as claimed in claim 11 wherein the purge valve is a mechanical valve.

20 23/13. The concentrator as claimed in claim 11 wherein the fluid comprises air, the first fluid is oxygen and the at least one second fluid comprises nitrogen.

25 24/14. A concentrator for obtaining an enriched stream of a first fluid from a stream containing the first fluid and at least one second fluid, the concentrator comprising:

(a) a pressurizable adsorption zone having an inlet port for introducing the fluid stream to the adsorption zone,  
30 the pressurizable adsorption zone operable to produce the enriched stream;

(b) a feed valve in flow communication with the inlet port and moveable between a closed position and an open position in which pressurized fluid is fed to the pressurizable adsorption zone;

5 (c) a pressurizable container for receiving at least a portion of the enriched fluid stream;

(d) a venting valve in flow communication with the pressurizable container and moveable between a closed position and an open position in which enriched fluid is vented from the pressurizable adsorption zone;

10 (e) an enriched fluid outlet for delivering at least a portion of the enriched fluid stream downstream of the concentrator;

15 (f) a purge valve in flow communication with the pressurizable adsorption zone and moveable between a closed position and an open position in which the pressurizable adsorption zone is purged during a purging cycle

20 wherein the elevated pressure of the fluid stream provides essentially the only motive force to operate the concentrator.

25 ~~25~~ 15. The concentrator as claimed in claim ~~14~~ <sup>24</sup> wherein each of the feed valve, the venting valve and the purge valve is operable to move between its open and closed positions in response to pressure differences upstream and downstream of the respective valve.

30 ~~16.~~ A pressure swing adsorption apparatus for producing an enriched stream of a first fluid from a stream containing the first fluid and at least one second fluid, the apparatus comprising:

(a) means for reversibly adsorbing the at least one

Sub B1

24

second fluid to produce the enriched stream;

(b) pressurizable storage means for receiving at least a portion of the enriched stream;

5 (c) outlet means in flow communication with the storage means for venting at least a portion of the enriched stream from the apparatus;

(d) purging means for removing at least a portion of the at least one second fluid from the means for reversibly adsorbing the at least one second fluid during a purging cycle; and,

10 (e) actuating means operably associated with the purging means for actuating the purging cycle upon the pressurizable storage means reaching a preset pressure.

15 17. The apparatus ~~as~~ claimed in claim 16 wherein the actuating means is a mechanical means.

27 18. The apparatus as claimed in claim ~~16~~ <sup>17</sup> wherein the actuating means is moveable between a charging position in which  
20 the pressurizable storage means is pressurized and an actuating position in which the purge cycle is actuated and the actuating means is biased to the charging position.

28 19. The apparatus as claimed in claim ~~18~~ <sup>27</sup> wherein the  
25 actuating means is a rigid member which moves outwardly from the pressurizable storage means along a pathway from the charging position to the actuating position.

29 20. The apparatus as claimed in claim ~~19~~ <sup>27</sup> wherein the  
30 actuating means is a resilient means.

- 30/ 21. The apparatus as claimed in claim 20 wherein the resilient means forms part of a wall of the pressurizable storage means.
- 5 31/ 22. The apparatus as claimed in claim 20 wherein the purging means has a purge actuator and the resilient means contacts the actuator when in the actuating position.
- 10 32/ 23. The apparatus as claimed in claim 22 wherein the purge actuator is spaced from and positioned outwardly from the resilient means and is contacted by the resilient means as the resilient means moves to the actuating position.
- 15 33/ 24. The apparatus as claimed in claim 20 further comprising mechanical linking means having a first portion and a second portion, the second portion operatively connected to the purging means, the resilient means contacting the first portion when in the actuating position.
- 20 34/ 25. The apparatus as claimed in claim 20 wherein the purging means is actuated when the resilient means expands by a set amount.
- 25 35/ 26. The apparatus as claimed in claim 16 wherein the purging means is spaced from and positioned outwardly from the actuating means and is contacted by the actuating means as the actuating means moves to the actuating position.
- 30 36/ 27. The apparatus as claimed in claim 16 wherein the purging means is spaced from and positioned directly outwardly from the actuating means and is contacted by the actuating means as

the actuating means moves to the actuating position.

37/ 28. The apparatus as claimed in claim 16 wherein the purging means is a pressure actuated valve.

5 38/ 29. The apparatus as claimed in claim 16 wherein the fluid comprises air, the first fluid is oxygen and the at least one second fluid comprises nitrogen.

10 30. A method for producing an enriched fluid having an increased concentration of a first fluid from a stream containing the first fluid and at least one second fluid comprising the steps of:

- 15 (a) the step of introducing the stream into a vessel containing a member for adsorbing the at least one second fluid;
- (b) the step of pressurizing the vessel for a time sufficient for the member to adsorb at least a portion of the second fluid to produce the enriched fluid;
- 20 (c) the step of cyclically passing the enriched fluid to a pressurizable container to pressurize the pressurizable container; and,
- (d) the step of driving a member by the pressure in the pressurizable container to commence a purging cycle of the vessel when the pressurizable container reaches a preset pressure.

25 31. The method as claimed in claim 30 wherein the member mechanically drives an actuator of a purge valve to commence the purging cycle and the method further comprises

30 automatically commencing the purging cycle when the pressurizable container reaches a preset pressure.

3/ 32. The method as claimed in claim 30 wherein the member is biased to a first position and mechanically drives an actuator of a purge valve to commence the purging cycle when in a second position and the method further comprises moving the member to contact the actuator due to the pressure increase in the pressurizable container.

4/ 33. The method as claimed in claim 30 wherein the member comprises a resilient member and the method further comprises the step of deforming the resilient member by the pressure in the pressurizable container to commence the purging cycle.

5/ 34. The method as claimed in claim 30 wherein the stream is at an elevated pressure and the method further comprises essentially only using the pressure of the stream to pressurize the vessel, to cyclically pass the enriched fluid to the pressurizable container and to commence the purging cycle.

20 35. A method for producing an enriched fluid having an increased concentration of a first fluid from a stream containing the first fluid and at least one second fluid comprising:

- 25 (a) introducing the stream into a vessel containing an adsorbent for adsorbing the at least one second fluid;
- (b) pressurizing the vessel for a time sufficient for the adsorbent to adsorb at least a portion of the second fluid to produce the enriched fluid and venting enriched fluid from the vessel; and,
- 30 (c) using the enriched fluid vented from the vessel to pressurizing an member to commence a purge cycle of



*Ad*  
the adsorbent.

*7/36* 36. The method as claimed in claim *6/35* wherein the member mechanically drives an actuator of a purge valve to  
5 commence the purging cycle and the method further comprises automatically commencing the purge cycle when the pressure of the enriched fluid moves the member by a preset amount.

*8/37* 37. The method as claimed in claim *6/38* wherein the  
10 member is biased to a first position and mechanically drives an actuator of a purge valve to commence the purging cycle when in a second position and the method further comprises moving the member to contact the actuator due to the pressure of the enriched fluid.

*9/38* 38. The method as claimed in claim *6/39* wherein the  
15 member comprises a resilient member and the method further comprises the step of deforming the resilient member by the pressure of the enriched fluid to commence the purging cycle.

*10/39* 39. The method as claimed in claim *6/40* wherein the stream  
20 is at an elevated pressure and the method further comprises using essentially only the pressure of the stream to pressurize the vessel, to vent enriched fluid from the vessel and to commence the  
25 purging cycle.